

## CLAIMS

### What is claimed is:

1. An acoustic transducer comprising:  
a frame;  
5 a diaphragm comprising:  
a surface portion, and  
a side portion connected to the surface portion; and  
a connection between the side portion of the diaphragm and the frame;  
where the connection joins the side portion of the diaphragm at points outside  
10 a plane of the surface portion of the diaphragm.
2. The acoustic transducer of claim 1, where the diaphragm has a center of mass,  
and where the connection is attached to the side portion of the diaphragm at locations that are  
substantially coplanar with the center of mass.
3. The acoustic transducer of claim 1, where the diaphragm comprises a sheet of  
15 material folded to form the surface portion and the side portion.
4. The acoustic transducer of claim 1, where the diaphragm further comprises a  
reinforcing skirt portion connected to the side portion.
5. The acoustic transducer of claim 1, where the diaphragm further comprises a  
reinforcing skirt portion connected to the side portion, and where the diaphragm comprises a  
20 sheet of material folded to form the surface portion, the side portion, and the skirt portion.
6. The acoustic transducer of claim 5, where the skirt portion and the side portion  
are joined by a right-angle fold in the sheet of material.
7. The acoustic transducer of claim 5, where the skirt portion and the side portion  
are joined by a fold in the sheet of material at an angle between 60° and 120°.
- 25 8. The acoustic transducer of claim 5, where the skirt portion and the side portion  
are joined by a fold in the sheet of material at an angle between 35° and 135°.

9. The acoustic transducer of claim 5, where the skirt portion and the side portion are joined by a fold in the sheet of material at an angle between 20° and 160°.

10. The acoustic transducer of claim 1, where the acoustic transducer is a cone-type transducer.

5 11. The acoustic transducer of claim 1, where the acoustic transducer is a low-profile transducer.

12. The acoustic transducer of claim 1, where the acoustic transducer is a cone-type transducer and the surface portion is a front edge of the diaphragm.

10 13. The acoustic transducer of claim 1, where the acoustic transducer is a low-profile transducer and the surface portion is a substantially flat projection surface.

14. The acoustic transducer of claim 1, where the diaphragm is a cone-type diaphragm with a center of mass, and where the connection is attached to the side portion of the diaphragm at locations that are substantially coplanar with the center of mass.

15 15. The acoustic transducer of claim 1, where the diaphragm is a planar-type diaphragm, and where the connection is attached to the side portion of the diaphragm at locations that are substantially coplanar with the center of mass.

16. The acoustic transducer of claim 1, where the connection is a pliable surround.

17. The acoustic transducer of claim 1, where the connection is formed at three points on the side portion of the diaphragm.

20 18. The acoustic transducer of claim 1, where the connection is formed in a continuous path around side portion of the diaphragm.

19. A low-profile transducer comprising:  
a frame;  
a diaphragm comprising:

25 a substantially planar projection surface, and  
a side portion connected to the surface portion;

a connection between the side portion of the diaphragm and the frame;  
where the connection joins the side portion of the diaphragm at points  
substantially outside a plane of the surface portion of the diaphragm;

a magnet structure mounted on the frame, where the magnet structure  
5 produces a magnetic-field region; and

an electrically conductive voice coil coupled to the diaphragm and extending  
out of a plane of the projection surface;

where the voice coil resides at least partially in the magnetic-field region.

20. The low-profile transducer of claim 19, where the connection is a pliable  
10 surround.

21. The low-profile transducer of claim 19, further comprising:  
a fin having a first edge and an opposing second edge;  
where the first edge of the fin is attached to the projection surface;  
where the fin extends in a direction away from the projection surface and into  
15 the magnetic-field region; and  
where the voice coil is mounted on the fin.

22. The low-profile transducer of claim 20, where the fin extends in a direction  
substantially perpendicular to the projection surface.

23. The low-profile transducer of claim 19, where the frame comprises a  
20 ferromagnetic material.

24. The low-profile transducer of claim 19, where the frame comprises a  
ferromagnetic material, and where the frame provides a return path for a magnetic field  
generated by the magnet structure.

25. The low-profile transducer of claim 19, where the magnet structure comprises  
25 a magnet and a portion of the frame.

26. The low-profile transducer of claim 19,  
where the frame comprises a ferromagnetic material,

where the magnet structure comprises a magnet and a portion of the frame,  
and

where the magnetic-field region is formed between the magnet and the portion  
of the frame.

5           27.     The low-profile transducer of claim 19, where the frame is non-ferromagnetic.

28.     The low-profile transducer of claim 19, where the frame is non-ferromagnetic  
and where the magnet structure comprises a magnet and a ferromagnetic material.

29.     The low-profile transducer of claim 19, where the frame has a substantially  
crenellated shape.

10          30.     The low-profile transducer of claim 19, where the frame includes a groove.

31.     The low-profile transducer of claim 19, where the projection surface of the  
diaphragm is in the shape of a rectangle.

32.     The low-profile transducer of claim 19, where the voice coil is mounted on the  
side portion.

15          33.     The low-profile transducer of claim 19, where the projection surface and the  
fin are formed from a single sheet of material.

34.     The low-profile transducer of claim 33, where a first 90° fold in the sheet of  
material is adjacent to a second 90° fold and the second 90° fold is adjacent to a 180° fold in  
the sheet of material.

20          35.     The low-profile transducer of claim 19, further comprising a filler material  
attached to the projection surface, and a second sheet of material attached to the filler  
material, where the filler material and the second sheet provide additional rigidity to the  
projection surface.

25          36.     The low-profile transducer of claim 19, further comprising a second sheet of  
material attached to the projection surface.

37. The low-profile transducer of claim 19, where the frame comprises a groove, and where the magnet structure is adjacent to the groove.

38. The low-profile transducer of claim 19, where the voice coil comprises an insulated metal wire.

5 39. A loudspeaker comprising the low-profile transducer of claim 19.

40. The loudspeaker of claim 39, further comprising at least one cone-type transducer.